

XXII.—*Observations on the Natural History and Economy of various Insects affecting the Turnip Crops, including the White Cabbage-Butterflies, the Turnip-seed Weevil, &c.* By JOHN CURTIS, F.L.S., Corresponding Member of the Imperial and Royal Georgofili Society of Florence, &c.

PAPER IV.

CABBAGE AND TURNIP BUTTERFLIES.

ALTHOUGH some caterpillars will feed upon a great variety of plants, for the most part they are confined to a few, and those are generally of the same natural order, that is to say, they are kindred species. This is the case with the Cabbage-Butterflies,* whose caterpillars not only frequently completely destroy that useful vegetable in the cottager's garden, but they live to a great and often to a mischievous extent upon turnips, rape, &c., as will be shown in the sequel. There are three species of these Butterflies, belonging to the ORDER LEPIDOPTERA, and to a FAMILY called PAPILIONIDÆ, which embraces all butterflies, amounting in Britain to about eighty species,† forming the Linnæan Genus *Papilio*; but the White Cabbage-Butterflies and two or three others have been separated by modern naturalists, and are now distinguished as the GENUS *PONTIA*.‡ The largest of these is abundant in gardens, turnip-fields, and road-sides, where it is seen on the wing from the middle of May to October: common as it is, and familiar as every child is with the White Cabbage-Butterfly, how few persons comparatively are acquainted with its origin and transformations! Its history will therefore prove interesting and instructive; but before we proceed to its economy, it will be necessary to describe it, in order to distinguish it from the two others alluded to. From the mischief the Caterpillars occasion to the cabbages it is called

I. *P. Brassicæ*, *Linn.*, or the White Cabbage-Butterfly. The *male* (fig. 1) is white above, the head and thorax are clothed with soft yellowish hairs; the two horns are spotted with black, and the club is black above and ochraceous beneath; the upper wings have black tips in the form of a crescent; the inferior wings have a blackish spot on the upper edge; the body is black; the wings expand $2\frac{1}{2}$ inches; the *female* is larger, being about 3 inches across, and is distinguished by two large black spots on the upper wings, and a freckled splash upon the inferior margin;

* *P. rapæ* departs from this rule; for it has been found feeding upon garden-flowers which are not cruciferous, and even upon the weeping-willow.

† Curtis's Guide, Genera 763-780.

‡ Curtis's Brit. Ent., fol. and pl. 48.

the under sides are alike in both sexes, the upper wings being white, with the tips yellow, and two large black spots near the centre; the under wings are likewise palish yellow, freckled with black; the head (fig. 2) is furnished with two hairy feelers in front, called palpi, the tips being pointed (*a*), and between them is concealed a long spiral tongue or proboscis (*b*).

The female deposits her eggs on various cruciferous plants, especially cabbages, turnips, mustard, rape, radishes, horse-radish, and water-cresses: they are laid on the under side of the leaves, in clusters of twenty or thirty (fig. 3), and are somewhat of the shape of a sugar-loaf, bright yellow, and curiously furrowed and reticulated, as shown in the magnified fig. 4. There is a constant succession of broods during the summer and autumn; one which attracted my notice hatched the 27th of August, and the little caterpillars immediately consumed all the egg-shells: on the following day they were like fig. 5, green before and yellow behind; a little hairy, with the head, two spots on the first thoracic segment, another on the tail, and numerous little dots, black: they kept together, feeding upon the turnip-leaf in groups, and in one night a single family ate a large hole completely through; they had 6 pectoral, 8 abdominal, and 2 anal feet, and possessed the power of spinning a fine slight web over the surface, probably to enable them to hold more securely to their food: in six days they changed their skins, after which they dispersed over the leaves; in about the same space of time they cast their skins a second time, when they were at least half an inch long, leaving their exuviae sticking to the stalks (fig. 6). When full grown they attain the length of about an inch and a half, and are as thick as a small goose-quill; they are then pale blue or green above, yellow beneath, with a line of the same colour down the back, edged with black dots; there is likewise a row of large black spots down each side, and numerous minute dots as well as fine hairs scattered over the body (fig. 7). Having arrived at this stage, they generally wander to some secure place, under ledges of paling, coping of walls, branches of trees, hedges, &c., and there attach their tails to some object, by very tough silken threads, and afterwards spin a similar cord from their mouths, which is fastened round the animal to support its head in an elevated position (fig. 8 *c*), and, gradually contracting its body, the skin is slipped off, and it is instantly changed to a shining pale green chrysalis, spotted and dotted with black (fig. 8), and in this tranquil state the latter broods rest suspended, uninjured by the storms and frosts of winter, until the genial warmth of spring calls the sleeping inmate into active life, and, as this proceeds, the black spots of the wings, although in miniature, gradually become more distinct through the horny transparent shell, and eventually

the butterfly bursts the back of the chrysalis, crawls out, and, holding by some object so that the little wings hang down, the fluids descend into them, they rapidly expand, and in the course of half an hour have attained their full size; they are, however, still flaccid, and require some time to dry and become adapted to flight.

The caterpillars of the White Cabbage-Butterfly greatly injured some Swedish turnips the end of last September, and no doubt frequently assist in reducing the foliage very considerably; but it is when the turnips, &c., are in seed that they are most to be feared. In July of the same year I received some of the caterpillars from Mr. C. Parsons, of Southchurch, Essex, who informed me that they were then committing extensive ravages on the white-mustard crops in parts of that neighbourhood, by eating off all the pods, and leaving the stalks bare, as shown in the stem, fig. 9. They commenced at the point of the pod, and continued eating until it was demolished, even to the base of the foot-stalk. "Had they attacked the crop," says Mr. Parsons, "at an earlier period of the season, the consequences would have been very serious indeed. Mustard-seed, both white and brown (*Sinapis alba* and *nigra*), is subject to the attacks of a small black larva, which I have not seen this year; but the damage done by the caterpillars I have sent has never been noticed in this neighbourhood."

I placed some of these larvæ upon radishes and turnips in seed, the green pods of which they were equally fond of, and ate, as above stated. They grew most rapidly during the few hot dry days we had near the middle of September, 1841, resting lengthways upon the naked stalks, after having cleared off all the seed vessels (fig. 7): on the 20th they appeared healthy, but inclining rather to a yellow colour: it rained during the night, and, on looking at them in the afternoon of the following day, I saw they had removed to a leaf, to which they stuck by four of their hinder legs, and to my surprise they were of a dirty colour, and rotten, the skins being lax, and lying just as the wind blew them about. I found they only contained some cream-coloured fluid, a portion of which was scattered upon the leaves. From this fact it may be inferred that wet is sometimes very destructive to them, probably during hot weather only; for after the heavy rains which fell the end of September and in October, I was astonished to see the cabbages in the cottage-gardens in Suffolk with multitudes of these caterpillars half and full grown, which had injured the crops so extensively, that not a leaf had escaped. It is scarcely credible that the labouring classes should thus suffer their crops to be spoiled, and their labour to be lost, when a little hand-picking every evening would soon relieve their gardens from these unwelcome visitors; but so it is.

If it were not for numerous parasitical insects, which deposit their eggs in these caterpillars, all chance of keeping them under in the field would be fruitless: the most serviceable of these agents is a little fly, which must be produced in myriads, for I have sometimes found that every caterpillar had been stung by this insect, which belongs to the ORDER HYMENOPTERA of the FAMILY ICHNEUMONIDES ADSCITI, and is named

2. *Microgaster glomeratus*, Linn.* It is black and thickly punctured: the horns are thread-like, longer than the body in the male, shorter in the female, and composed of 18 joints or upwards: the eyes are lateral, with three little eyes or ocelli upon the crown: the abdomen is shorter than the thorax, depressed, linear, smooth and shining; the basal segment is a little narrowed, with the edges on the sides dirty white: ovipositor concealed beneath the abdomen: the four wings are very transparent, iridescent, with a distinct pitchy-coloured stigma on the superior; the nervures lighter, the areolet open externally: legs bright ochreous, hinder thighs black on the upper edge, darkest at the apex, tips of their shanks and tarsi brownish, the apex only of the four anterior brown: length a little more than one line; expanse three (fig. 10).

This minute Ichneumon-fly lays numerous eggs in the caterpillars of the White Cabbage-Butterfly, which hatch and feed within their skins in almost incredible numbers, the victim feeding and growing until it has attained its full size, when, instead of changing into a chrysalis, like fig. 8, a number of fleshy maggots (fig. 11) come through its skin, and form beautiful little oval silken cocoons in masses beneath and around it, like the balls of the silkworm in miniature (fig. 12); they are bright yellow; and I counted sixty-seven which issued from one unfortunate larva. On opening a caterpillar thus infested, it will be found full of little fat maggots (fig. 11), which eventually consume all the muscles, leaving only the alimentary canal untouched: those in my possession, which spun up in September, hatched the beginning of the following May, when they were ready to commence their invaluable operations upon the early broods of the White Cabbage-Butterflies. Reaumur says the *Microgaster* pierces the skin of the caterpillar with its short oviduct, and deposits an egg; it then withdraws it, and repeats the operation, until thirty eggs or more are introduced into the living caterpillar, and they are inserted sufficiently deep not to be cast off with the skin: the maggots avoid feeding on the vital parts, so that the caterpillar does not die until two or three days after the parasites have eaten their way out to spin their cocoons, but the caterpillar, being exhausted, gene-

* Curtis's Brit. Ent., fol. and pl. 321; Guide, Genus 554, No. 54.

rally dies close to his murderers. Even these parasites are subject to the attacks of a beautiful little fly, called *Diplolepis* (*Pteromalus*?) *Microgastri* of Bouché,* the maggots of which live in the pupæ of *Microgaster glomeratus*, three or four together, and the silken cases which are inhabited by these parasites are paler than the healthy ones: thus one little animal lives upon another; so that the laughable lines of the facetious poet are partly verified:

“ That fleas have little fleas to bite ’em,
And so go on *ad infinitum*.”

Persons who are ignorant of the wonderful operations of nature, often mistake these yellow cocoons formed by the maggots for the eggs of the caterpillars, and accordingly destroy them, although they ought rather to be preserved; and others, on opening a caterpillar of the White Cabbage-Butterfly and finding it full of little maggots, have supposed they were the young of it. Such errors are the offspring of ignorance, and contrary to the laws which regulate the generation of these animals; and I trust that these careful investigations will meet with the attention of agriculturists, that they may take a correct view of these subjects, which are at once interesting and of absolute importance to mankind.

There is also a large Ichneumon-fly, the larva of which lives singly in the chrysalis of *P. Brassicæ*, and changes into a white pupa inside, without forming any case: the fly hatches in two or three weeks; it is likewise HYMENOPTEROUS, and of the FAMILY ICHNEUMONIDÆ: it has been named

3. *Pimpla instigator*, *Fab.*; † it is black and thickly punctured; the two slender horns are not so long as the body, and composed of numerous oblong joints; the elliptical abdomen is only slightly narrowed at the base; the thighs, shanks, and feet are bright fulvous, excepting the hinder feet, which are brown or black; the four wings are dull-yellowish, but iridescent, the stigma and nervures brown, the areolet is rhomboidal; the female has a stout ovipositor projecting beyond the apex, and is nearly half as long as the abdomen: the male is often $\frac{1}{2}$ an inch long, the wings expanding more than $\frac{3}{4}$ of an inch, and the female is considerably larger. This powerful insect likewise infests the caterpillars of many moths, and emits a most offensive scent when touched: I have frequently seen the females running over fruit-trees, investigating every leaf and crevice to find a proper object to receive their eggs: they are met with from Midsummer to Michaelmas.

There are other parasites which destroy the chrysalides; and one of the most essential of these is a minute brilliant fly, which deposits its eggs upon the outside of the chrysalis of the Butterfly,

* *Naturgeschichte der Insecten*, p. 168.

† *Curtis's Brit. Ent.*, fol. and pl. 214; and *Guide*, Gen. 515, No. 103.

as soon as the caterpillar has cast off its skin, when it is both soft, tender, and exhausted, so that it has not the power to exert itself and frighten away the little parasites: the eggs soon hatch and eat into the pupa, which at that early stage is almost liquid inside, the members of the future butterfly not being organised. Sometimes 200 or 300 of these little maggots live in one chrysalis; they undergo their metamorphoses securely within the shell, and the flies hatch and eat their way out in about fourteen days in summer, but some remain through the winter, and when they come forth they do not fly away, but hover in swarms about the perforated pupa, the males probably hatching first and waiting until the females emerge to be impregnated; but after their bridal dance, each female departs in search of recently formed chrysalides to deposit fresh broods in. If we take 250 as the average number of eggs which a female lays, and admit that one-half of them are of that sex, the second generation would amount to upwards of 30,000, an enormous increase, which is in all probability multiplied several times in the course of one season. Some species of this extensive genus swarm even in our houses, especially in the country, where in October and November I have seen immense numbers inside of the windows, and I believe they hibernate behind the shutters, in the curtains, &c. The species above alluded to is likewise HYMENOPTEROUS, and of the FAMILY CYNIPIDÆ, or CHALCIDIDÆ; it may be the *Ichneumon puparum* of Linnæus, but as that is very doubtful I have named it

4. *Pteromalus Brassicæ*.* *Female* dull blackish-green, thickly punctured; head large, antennæ clavate, black, basal joint ochraceous; abdomen oval, depressed and pointed, black, shining, bright-green at the base, with a violet tint beyond it; wings transparent, iridescent, with an ochraceous nervure along the upper or costal margin of the superior, forming a short branch beyond the middle; legs bright ochre, coxæ black, thighs, excepting the base and tips, pitchy, apex of feet black; length 1 line, expanse nearly 3 (fig. 13).

The first broods of this little parasite hatch in April, and I have bred multitudes of them from a chrysalis of *Pontia Brassicæ*. I suspect the following insect will prove to be the male of it, different as it is in appearance, having bred several from the pupa of one of the White Cabbage-Butterflies many years since, when I gave it the name of

5. *Pteromalus Ponticæ*. *Male* brilliant green, thickly punctured, head brown, horns ochraceous, filiform; abdomen linear, concave, apex ovate, very shining, often with a golden tinge; 4 wings,

* Guide, Gen. 627 and 641; and vide Brit. Ent., fol. and pl. 166, *Colax dispar*.

as in *P. Brassicæ*; legs, excepting the coxæ, bright ochraceous, tips of feet pitchy; length rather more than 1 line, expanse $2\frac{1}{2}$ lines.

We now come to the 2nd species of White Butterfly injurious to turnips; it likewise feeds upon cabbages, mignonette, nasturtiums, &c.; it makes its appearance with the White Cabbage-Butterfly, which it very much resembles, but is smaller; the eggs vary, and the caterpillar and pupa are quite different: from its feeding on the turnip it is called in England the "Small White" or "Turnip Butterfly," and for the same reason Linnæus named it

6. *Pontia Rapæ* (fig. 14): the *male* is white, the superior wings have black tips dusted with white, and the inferior wings have a black spot on the upper edge: the *female* is similar, but has two large black spots likewise beyond the centre of the superior wings; underside of the same white, the apex yellow, and two black spots beyond the middle, the lower one sometimes nearly obliterated; inferior wings yellow, freckled with black: length of male 8 lines, expanse about 2 inches; the female is larger and sometimes of a duller colour; but I possess a male, taken near Oldham in Lancashire, which has all the wings of a bright yellow colour.

The female lays her eggs *singly* on the under sides of the leaves, and they are not very unlike those of *P. Brassicæ* in form and sculpture, but the caterpillars are totally different, being green and so densely clothed with minute hairs as to be velvety; they have a yellowish stripe down the back and another along each side, the belly being of a paler brighter green; they are often more than an inch long, and about as thick as a large crow-quill (fig. 15): they change to a chrysalis, suspended in like manner to fig. 8, but it is of a pale flesh-brown, freckled with black (fig. 16).

The 3rd species is the "Rape-seed," or "Green-veined White Butterfly," to which Linnæus, from its feeding upon the cole-seed, gave the appellation of

7. *Pontia Napi* (fig. 17): the *male* is white, head, thorax, and body black, clothed with yellowish down; superior wings with the tips powdery black and the nervures greyish; inferior wings with a black spot on the upper margin, and the dark nervures shining through. *Female* with the nervures in the superior wings darker, the apex blacker, and two large black spots beyond the middle: under side of superior wings with the same two black spots; the apex is yellow and the nervures are dark, forming grey stripes: the inferior wings are pale-yellow, with the nervures still more distinct, from the broad grey margin which surrounds them. In some examples the nervures are much less strongly marked, which may be a difference between the spring and autumnal broods, or

it may arise from their crossing with *P. Rapæ*, for hybrids undoubtedly exist amongst insects. The males are nearly $\frac{3}{4}$ of an inch long, and scarcely expand 2 inches; the females are a little larger.

The eggs of this species are also laid singly on the under side of the leaves of cabbages, turnips, and other Cruciferæ; they are long, cylindric, of the form of a sugar-loaf, channelled, striated transversely, and whitish (fig. 18): the caterpillars are about the size of the foregoing; they are of a delicate green colour, densely clothed with velvety hairs, the spiracles or breathing pores down the sides being reddish-yellow (fig. 19); and when lying stretched out on the leaves, as they do by day, they are scarcely visible to the eye. The chrysalis is suspended like the others; it is of a pale greenish-white, or yellow and freckled, with the beak and points brown (fig. 20).

There are two broods of this Butterfly in a year, one in April or May and another in July or August; the caterpillars are most injurious in gardens, where last year they not only fed upon the turnip-leaves, but did great mischief to the cabbages, especially in September, eating the central leaves, like the caterpillar of the Cabbage-Moth, *Noctua Brassicæ*, and I killed several as late as the 22nd of September. I have found the pupæ of this species with a largish hole on one side, from which had issued a parasitic Ichneumon; and I bred an incredible number, considering their size, of males and females of this fly in July or August from one pupa; it is called by Gravenhorst*

8. *Hemiteles melanarius*:† the *male* is entirely black and punctured; the abdomen is roughly punctured, the margins of the segments and the apex are smooth and shining, the two slender horns are scarcely so long as the animal: the wings are beautifully iridescent, the nervures and stigma pitchy, the areolet is open outside; legs black; the apex of four anterior thighs and their tibiæ are tawny, the feet are brownish, but the basal half of the hinder tibiæ alone is tawny: length 2 lines, expanse near 4 lines: the female differs so materially that no one would suppose it was the legitimate partner of the foregoing male: it is black, but the abdomen is red, excepting the basal segment and the apex; the ovipositor is exerted, and is half the length of the abdomen: the thighs and shanks are red, the apex of the hinder tibiæ and all the tarsi are brown: length, including the ovipositor, nearly $3\frac{1}{2}$ lines, expanse almost 5 lines.

Where any of the White Butterfly caterpillars abound, there are several methods of reducing their numbers and checking their increase; the best is to look in the winter for the chrysalides,

* Ichneumonologia Europæa, vol. ii. p. 790, No. 233.

† Curtis's Guide, Gen. 503, No. 233.

which are concealed under ledges of walls, paling, doors, window-sills, on bushes in hedges, on the trunks of trees, &c., and crush them, but on no account to destroy the dark-brown coloured ones, which are full of the parasitic *Pteromali*: as the spring advances, examine the leaves and bruise the clusters of eggs of the largest species, which are as conspicuous as a mass of fly-blows; at the same time a ring or bag-net may be used to catch the butterflies; and when the caterpillars are large enough to be seen, hand-picking is neither difficult nor laborious: when they attack the seed-crops, shaking the stems might prove useful, provided troops of ducks were to follow and pick up the caterpillars; or dusting the plants with hellebore-powder, fresh and genuine, would be worth a trial, as it is very effective in some instances.* After what has been stated, it is almost needless to say that the little yellow cocoons observed upon the plants and leaves, and often surrounding the caterpillars, ought never to be destroyed, as they contain a parasite which proves the cultivator's greatest friend and the most active scourge of the Turnip and Cabbage Caterpillars.

Even the obnoxious and persecuted wasp assists in the destruction of other insects, upon which it preys, making some amends for robbing our orchards. When at the end of summer the sweet thistle-flowers attract a variety of butterflies and swarms of insects, the wasps are busily employed in capturing them, which they do very skilfully. I have many times seen them carry off large flies from the ivy-flowers, and even the White Butterflies are not too large to deter the wasps from attacking them: the species called *P. Rapæ* it seems is most subject to their assaults, and their mode of securing this Butterfly is very curious as related by Mr. Newport in the 'Entomological Transactions.'

On breaking off some of the turnip-leaves close to the crown last October, I found enclosed in the stem (fig. 21) two caterpillars nearly $\frac{1}{2}$ an inch long, of a whitish colour, with a nut-brown head (fig. 22); they were evidently the larvæ of some small moth, but they both died.

CHRYSOMELA BETULÆ?

I also discovered in July, on the backs of some turnip-leaves, many small oval eggs (fig. 23), so deeply imbedded in the pulpy substance, that in many instances the cuticle had burst on the upper side, so that the eggs, which were of a bright ochraceous colour, were perfectly visible; the surrounding margins of the leaf were dried and of a dark-brown colour. There were mul-

* Mr. Lymburn cleared a few hundreds of gooseberry-bushes from caterpillars, at the expense of 1s. 3d. for hellebore-powder, and a morning's work of two men.—*Gardeners' Chron.*, Jan. 1st, 1842, p. 7.

titudes of larvæ with them, which had emerged from the eggs, and were eating holes in the leaves. (fig. 24.) These larvæ can crawl about, having six pectoral feet and a proleg at the tail, the intermediate segments being very much produced, like nipples on the sides; they are of a smoky yellow colour, spotted with black; the head is black, with short antennæ and four small feelers; the 1st thoracic segment is dull, the 2nd and 3rd have four small black spots on the disc, and the following only two, but larger (fig. 25); they are slightly hairy, and there is a line of brown tubercles on each side close to the spiracles, from which the animal can protrude yellow shining glands, when it is excited or put to pain: these larvæ are of course very small at first, and never attain a large size, yet they eat innumerable holes in the leaves. I placed several upon a turnip-leaf, and believe they entered the earth to become pupæ, for they soon disappeared. There is no doubt that they change to a beetle of the Genus *Chrysomela*, which belongs to the same Family as the "Turnip-fly Beetle" (*Altica Nemorum*);* but it cannot leap, and it is far from improbable that these larvæ are the offspring of

9. *Chrysomela* (Phædon) *Betulæ*, *Linn.*: † a brilliant shining blue or green oval beetle, with the under side, horns, and legs black, and about $1\frac{1}{2}$ line long, which I have often found upon turnip-leaves.

CURCULIO ASSIMILIS, the Turnip-seed Weevil.

I shall for the present notice only two other insects, both of which are injurious to the turnips when in flower and seed: the economy and habits of one were only discovered last summer by a friend, who sent me some turnip-seed in a pill-box the end of June, containing also twenty or thirty maggots: on scattering the contents of the box upon a sheet of paper, the maggots stretched themselves straight out and walked very well. I was at the same time informed that a small bag of fresh rubbed-out "nimble-nine-weeks" turnip-seed was strewed in a paper tray and placed before the fire for the purpose of being well dried, when numbers of these little maggots were seen crawling amongst the seeds. On examining the seeds, however, I could not find any holes in them; I therefore placed the maggots in a pot of earth, and they soon buried themselves. About a week after this my correspondent examined some of the remaining pods of the turnip, and found one with a small hole in it (fig. 28): on splitting it open it was evident that the seeds had been eaten, and it appeared that the hole had been made by a maggot in order to effect its exit: three pods

* Royal Agr. Soc. Jour., vol. ii. pl. A, figs. 4 and 5.

† Curtis's Guide, Gen. 433, No. 5.

were also forwarded to me, each being punctured, and on opening them I found only one seed untouched, and two that were but slightly eroded; others were half consumed, and many entirely eaten up—a hard gummy substance of a dark colour enclosing the spot occupied by the maggots, which might be the dung compressed by the animal: but to connect these circumstances satisfactorily with the maggots, it is necessary to state that one of them was found in a pod: the maggots are fat and yellowish white, the body is formed of numerous convex muscles, the head is pale brown (figs. 26 and 27): they buried themselves 2 or 3 inches beneath the surface, and enclosed themselves in brown oval cocoons (fig. 29), which were very brittle, and formed of the agglutinated grains of earth, and in one I found the pupa (fig. 30); it was of a dull ochraceous tint, the eyes black, and on being magnified, the rostrum, legs, and wing-cases were very distinct (fig. 31). After remaining three weeks in this inanimate state the beetles began to hatch, and by the 21st of July nearly twenty specimens were liberated: they proved to be a small Weevil which is abundant during the summer in the flowers of the turnip, cabbage, and other cruciferous plants, the wild-mignonette (*Reseda lutea?*), &c., and no doubt deposits its eggs at that time in the embryo pods. It belongs to the ORDER COLEOPTERA, of the FAMILY CURCULIONIDÆ, or Weevils, and is called, by entomologists of the present day,

10. *Ceutorhynchus assimilis*, *Payk*,* the Turnip-seed Weevil; it is also known as the *Curculio obstrictus* of Marsham. It is black, clothed with short white depressed hairs above and scales beneath, which give the insect a grey tinge; rostrum long, slender, and arched, smooth and naked towards the apex, furnished with two geniculated or kneed horns, placed on each side a little beyond the middle, composed of twelve joints, the basal joint long, the seven following short and nearly globose, excepting the second and third, the terminal ones forming an ovate-conic club, hoary at the apex; eyes placed on each side at the base of the rostrum; thorax triangular, the anterior part being the narrowest and truncated, the margin reflexed, thickly and coarsely punctured, with a tubercle on each side somewhat towards the base; there is an impression down the middle terminating in a fovea behind, with a short channel in the breast to receive the rostrum in repose; elytra short and ovate, with about eight fine channels on each, the interstices punctured; wings ample; legs rather short; thighs thickish, narrowed suddenly towards the apex, the hinder have a single short tooth beneath; shanks straightish, the apex rounded and pectinated; feet four-jointed, two basal joints some-

* *Curtis's Guide*, Gen. 345, No. 43.

what triangular, third bilobed, fourth slender and clavate, furnished with two claws: $1\frac{3}{4}$ line long, including the rostrum (fig. 32).

In the 'Introduction to Entomology' it is stated by one of the learned authors of that interesting and invaluable work that a small Weevil has been bred by him from the knobs or galls on the roots of the Kedlock (*Sinapis arvensis*).* This little Beetle is similar in form and nearly related to the foregoing insect, but it is infinitely smaller, and has been named by Marsham

10*. *Curculio* (*Ceutorhynchus*) *contractus*. It is black with a coppery tinge; the head and thorax are coarsely punctured; the elytra are generally green, sometimes inclining to blue, rarely blackish; they have punctured striæ down each, with lines of minute hairs between them, and the apex is tuberculated: length from $\frac{3}{4}$ to 1 line.

This little Weevil in the perfect or beetle state destroys the young turnips by puncturing the leaves, as I am informed by Dr. J. W. Calvert, who thus confirms the statement in the 'Introduction to Entomology,'† where it is said that almost as much damage is sometimes occasioned by this little Weevil as by the Turnip-fly (*Altica Nemorum*); and Dr. Fleming, of Flisk, also bears testimony to the injury this *Curculio* does to the turnip-crops.

As all these weevils are so sensitive that they fall down, if only approached suddenly, from the flowers or leaves on which they are feeding, they may be easily collected, when they abound in the turnip-flowers left for seed, by shaking the stalks over a bag-net or cloth; but as they immediately unfold their legs and begin to run away after the shock is over, the contents thus collected must be swept into a pail of lime and water or urine until they can be removed and destroyed by pouring boiling water over them, for, as their horny jackets are very hard, they are not easily killed by stamping upon them.

CETONIA AURATA, the Green Rose-chaffer.

Another large and beautiful beetle, whose larvæ are exceedingly injurious in gardens and nurseries,‡ sometimes does great mischief the beginning of May to the turnips then in flower and intended for seed by destroying the anthers, by which means the flowers prove abortive; and as these beetles often breed amongst strawberry-beds, and first attack their flowers, it is not safe to have turnips to be reserved for seed cultivated in a garden or in the vicinity of one where that fruit is grown, for the beetles fly well, especially

* Vide Kirby and Spence, vol. i. p. 450.

† Ibid., vol. i. p. 185.

‡ Gardeners' Chronicle for 1841, p. 452.

in the sunshine, and after consuming the flowers in one spot they can readily fly to another for the same purpose. This handsome beetle naturally belongs to the ORDER COLEOPTERA and the FAMILY MELOLONTHIDÆ, and is called *Scarabæus* by Linnæus, but it now bears the designation of

11. *Cetonia aurata*, or the Green Rose-chafer: it is of a brilliant metallic green, often having a golden or copper hue; the head is oblong, notched in front, and thickly punctured; the eyes are prominent; the horns short and ten-jointed, terminated by an oval club formed of three plates; the thorax is large, punctured, somewhat triangular or semi-ovate, the sides rounded, the base indented; the sides of the trunk have a spine on each side, which is very visible even when viewed from above; the scutellum is large and elongate-trigonal; the elytra are oblong, the shoulders project, with a scale on each side of their base, and hollowed out where the spines are; they are punctured; the suture is keeled, especially towards the apex, which is truncated, and leaves the extremity of the abdomen exposed; there are various spots upon the elytra more or less of a pure white or ochraceous colour, forming transverse but irregular streaks towards the hinder part, as if the surface was cracked: the wings are very long, rusty yellow, with horny ferruginous nervures, and are folded beneath the elytra, excepting in flight; the under side is coppery, inclining to rose-colour; the face, thorax, and breast are clothed with soft ochraceous down, the latter with a metallic knob projecting between the base of the two intermediate thighs; the legs are strong, anterior the shortest; the shanks are ciliated with ochraceous hairs on the inside, the anterior are notched externally, forming three teeth, the others have a tooth outside, about the middle; they are all furnished with a pair of spines at the apex called spurs, excepting the anterior, which have only one; the feet are rather long, slender, and slightly compressed, composed of five joints, the terminal one being the longest, and producing a pair of strong claws:* length from 8 lines to more than $\frac{3}{4}$ of an inch (fig. 33).

These beetles not only attack the flowers of the strawberries and turnips, but they may be found nestling among the petals and stamina of the white-thorns, mountain ash, elder, roses, lilac, candytuft, peony, &c. The female, like the cockchafer (*Melolontha vulgaris*),† deposits her eggs in the ground, where they hatch and produce little maggots, which live two or three years underground, feeding upon the roots of grass and various plants until they are full grown, when they are as thick as a swan's quill and an inch and a half long, fat and whitish, with an ochraceous

* Curtis's Brit. Ent., pl. and fol. 374.

† Ibid., fol. 406.

head; short, horny, and strong jaws; six short pectoral feet, all of a rusty ochraceous colour: the body is composed of numerous rings of muscles, clothed with transverse series of ferruginous hairs, which enable the animal to progress more readily upon its back; the hinder portion is the thickest, curved, and of a lead colour, and is sparingly covered with rusty hairs; on each side of the first thoracic segment is a horny rusty spot, which readily distinguishes it from the grub of the "Great Cockchafer," which is also hairless, with feet of a different shape. When they have arrived at their full growth they form an oval case of earth at a considerable depth as large as a walnut, which is covered outside with the excrement of the animal, formed of oval pellets of the soil, and resembling the dung of mice. It is very remarkable that the larvæ of the Green Rose-chafers often live in ant-hills, without being annoyed or attacked by those hostile little animals, whence in some countries they are called "King of the Ants;" and it is also said, but it is scarcely credible, that many German cattle-dealers attribute to these grubs supernatural powers, that they feed them in boxes, believing that as they thrive, so will their cattle increase and their fortunes prosper!* It is to be hoped this was the superstition of bygone days, and that the light which has dawned upon Europe during the happy years of peace, when the Arts and Sciences have been cherished and cultivated, has enlightened the minds and exposed the follies of the darker ages, when war and rapine engrossed the energies and debased the understandings of all classes.

When the sun shines and the Green Rose-chafers are flying about, they may easily be caught with a bag-net; but early in the morning, before they are revived by the rays of the sun, or in the evening, when they repose in the flowers, it is easy to pick off these large and conspicuous beetles; they may be collected into cans or bottles of water, and afterwards taken away and thrown into boiling water to deprive them of life.

Having often alluded to a ring or bag-net for catching insects, it may be useful to give instructions for making this instrument, which may be easily done by getting three or four feet of wire, not less than a quarter of an inch thick; bend the wire into a ring at least one foot across; the ends must then be soldered into a ferrule, or made to screw or slip into one with a catch to hold it fast, at the pleasure of the maker. The ferrule must be firmly fixed at the end of a staff or stout walking-stick 2 or 3 feet long; and a bag from 1½ to 2 feet long, made of canvass, such as ladies use for worsted-working, or that employed in cheese-presses, or any coarse gauze that will allow the air to pass through, must be

* Curtis's Brit. Ent., fol. 374.

sewed or fastened round the iron ring; or if a sheath of leather be first fixed round the ring, the bag may be attached to it, which will make it last longer, and it can be more readily replaced when it is worn out by sweeping herbage or other rough work. With such a net any insects may be readily caught with a little practice. The net described is adapted to brush bushes and sweep along the ground, &c.; but if one be required for catching butterflies by day, or moths in the evening, the ring must be lighter, the stick may be made of a cane or bamboo, and the bag should be of silk-gauze or bobbinet.

Summary of the foregoing Report.

There are *three species* of White Butterflies which injure the Turnip and Cabbage crops.

The first is called the "*White Cabbage-butterfly*," which deposits its eggs in clusters on the under side of Cabbage, Turnip, Mustard, Rape, Radish, Horseradish, and Watercress leaves.

When first hatched the *caterpillars* live in *society*; but when a week old they disperse.

They remain through the *winter* in the *Chrysalis* state, suspended in secure retreats in walls, paling, &c.

The *caterpillars* greatly injured some *Swedish turnips* last September.

They do still greater mischief by eating off all the *Pods*, in crops of *Turnips* and *Mustard* left for seed.

The full-grown *caterpillars* died suddenly of some disease after a wet night, during very hot weather.

Cabbages in cottage-gardens might be readily freed from this pest by *hand-picking*.

A Parasitic fly, called *Microgaster glomeratus*, lives in and destroys great numbers of the caterpillars.

The *little yellow silken cases* found round the dead caterpillars should never be destroyed, as they contain these useful parasites, whose operations are certain and invaluable.

Ignorant persons destroy them, believing them to be the eggs of the caterpillars; but caterpillars never lay eggs.

The *Microgaster* has also a smaller parasite which lives upon it, called *Diplolepis Microgastri*.

A large Ichneumon, called *Pimpla instigator*, also lives in the caterpillars of the *White Cabbage-butterfly*.

Pteromalus Brassicæ and *P. Ponticæ*, two other minute flies, lay their eggs upon the *Chrysalis*, and materially assist in keeping these butterflies in check.

The second species, "*The small White*" or "*Turnip butterfly*," lays her eggs not in clusters, but singly, on the under side of the leaves of *Cabbages*, *Turnips*, *Mignonette*, *Nasturtiums*, &c.

The third species is the "*Rape-seed*" or "*Green-veined White-butterfly*," which also lays its eggs singly on Cabbages, Turnips, &c.

These caterpillars eat into the central leaves of the Cabbages, and did great mischief last year.

Of all these Butterflies, there are *two broods annually*, one in spring, the other in summer.

A little Ichneumon, called *Hemiteles melanarius*, infests and destroys the Chrysalides.

To get rid of the Cabbage-caterpillars, look for and *destroy* the *chrysalides* in winter; in the spring *crush* the clusters of *eggs*, *hand-pick* the *caterpillars*, and catch the butterflies in the garden.

In *seed crops* shake the stems, and let in troops of *Ducks* to pick up the caterpillars as they fall down.

Hellebore-powder recommended to destroy them.

Wasps destroy many insects, and amongst others the *White Cabbage-butterflies*.

The caterpillar of a *small moth* lives in the footstalks of the Turnip-leaves.

The leaves are often *eaten* by the small black larva of a beetle, *Chrysomela Betulæ*?

A small maggot lives in the *Pods* of the Turnip, eating the seeds; when full fed it eats its way out of the pod, and changes in the earth to a pupa, from which comes the Weevil called *Curculio assimilis*, which inhabits the flowers of the Turnip, Cabbage, &c.

Another Weevil, the *Curculio contractus*, punctures the Turnip-leaves to a great extent.

These small *beetles* may be *collected* by shaking the flowers over a cloth or bag-net.

The *Green Rose-chaffer* seriously injures Turnip-flowers, by devouring the anthers, and rendering the germen abortive.

The *eggs* are laid in the ground, where they become maggots, and live three years in that state.

The conspicuous *Green Rose-chaffer* should be collected by *hand-picking*, and killed with boiling water.

Instructions for making a *Bag-net* to catch *insects*.

EXPLANATION OF THE PLATES.

Fig. 1. The White Cabbage-butterfly at rest.

Fig. 2.*The head in profile.

a. The two palpi or feelers.

b. The spiral tongue or proboscis.

Fig. 3. A cluster of the eggs on the under side of a leaf.

- Fig. 4.* A single egg magnified.
- Fig. 5. The young Caterpillar when first hatched.
- Fig. 6. Their skins cast off, and sticking to the stalk.
- Fig. 7. A full-grown Caterpillar.
- Fig. 8. The Chrysalis suspended to the stalk.
c. A silken thread, which sustains it with the head uppermost.
- Fig. 9. A branch of the White-mustard (*Sinapis alba*), showing how the pods have been entirely eaten off to the stem below, and the ends of the seed-vessels consumed above.
- Fig. 10.* A parasitic fly, called *Microgaster glomeratus*, which destroys the Caterpillars of the Cabbage-butterflies.
d. The natural size.
- Fig. 11.* One of the Maggots taken out of the body of a Caterpillar.
e. The natural size.
- Fig. 12. A cluster of yellow silken balls, called Cocoons, which have issued from the body of the caterpillar, and each of them will produce a fly like fig. 10.
- Fig. 13.* Another parasitic fly, called *Pteromalus Brassicæ*, which destroys the Chrysalides of the Cabbage-butterflies.
f. The natural size.
- Fig. 14. "The small White Turnip-butterfly" at rest.
- Fig. 15. The Caterpillar of the same.
- Fig. 16. The Chrysalis fixed by its tail and a thread to the stem.
- Fig. 17. The "Rape-seed" or "Green-veined White-butterfly," represented standing.
- Fig. 18.* The egg magnified.
† Two of the eggs of the natural size, laid singly on the under side of a leaf.
- Fig. 19. The Caterpillar of the same.
- Fig. 20. The Chrysalis suspended like the others.
- Fig. 21. A Turnip-leaf broken off to show a cavity in which a caterpillar was living.
- Fig. 22. The Caterpillar alluded to.
- Fig. 23. The eggs of a Beetle laid on the under side of a Turnip-leaf.
- Fig. 24. One of the larvæ feeding, which hatched from the eggs.
- Fig. 25.* The same larva magnified.
g. The natural size when full grown.
- Fig. 26. A Maggot which lives in the pods of the Turnip, and consumes the perfect seeds.
- Fig. 27.* The same magnified.
- Fig. 28. The aperture eaten by the maggot to get out when it has arrived at maturity.
- Fig. 29. The little case which it forms in the earth.
- Fig. 30. The Chrysalis taken out of the case or cocoon.
- Fig. 31.* The same magnified, showing the limbs, &c., of the future Beetle.
- Fig. 32. The Turnip-seed Weevil, called *Curculio assimilis*, which is the parent of the above maggot.
h. The natural size.
- Fig. 33. "The Green Rose-chafer," *Cetonia aurata*.

